



Partial translation of JP-A-09-052776

- (11) Publication number: 09-052776
(43) Date of publication: February 25, 1997
5 (21) Application number: 07-242262
(22) Date of filing: August 17, 1995
(71) Applicant: UBE INDUSTRIES, LTD.
(72) Inventor: Tomohiro ISHIKAWA et al.
(54) Title of the Invention: Fiber bonded ceramic and its
10 production process
-

(translation of Abstract)

- (57) [Abstract]
15 [Object] To provide a fiber bonded ceramic which has high strength and fracture resistance and can maintain excellent dynamic properties in air at 1,000 °C or higher.
[Constitution] The fiber bonded ceramic is composed of inorganic fibers of Si-M(Ti or Zr)-C-O, an inorganic material
20 which contains Si-O and dispersed MC with 100 nm or less and exists so as to fill interstices between the inorganic fibers, and a carbon layer existing as a boundary layer between the inorganic fibers and the inorganic material, and the fiber bonded ceramic has an inorganic fiber content of at least 80 %
25 by volume.

(translation of claims 1 and 2 at lines 1 - 35 in the left column of page 1)

[Scope of Patent Claims]

- 30 [Claim 1] A fiber-bonded ceramic composed of
inorganic fibers containing an amorphous substance
(a) comprising Si, M, C and O, an assembly (b) of crystalline

ultrafine particles of β -SiC, MC and C and amorphous substances of SiO₂ and MO₂ (M is Ti or Zr), or a mixture (c) of the above amorphous substance(a) and the above assembly (b), and

an inorganic substance containing an amorphous substance (d) comprising Si and O and optionally comprising M, a crystalline substance (e) comprising crystalline SiO₂ and/or MO₂, or a mixture (f) of the amorphous substance (d) and the crystalline substance (e), and further containing dispersed crystalline ultrafine particles of MC having a particle diameter of 100 nm or less, the inorganic substance existing so as to fill interstices between the inorganic fibers,

which ceramic is characterized in that the content of the inorganic fibers is at least 80 % by volume and that the fiber-bonded ceramic has layers with a thickness of 1 to 200nm comprising amorphous and/or crystalline carbon, as boundary layers between the inorganic fibers and the inorganic substance.

[Claim 2] A process for the production of a fiber-bonded ceramic, which process comprises hot-pressing a laminate material of inorganic fibers in an inert gas under a pressure of from 50 to 1,000 kg/cm² at a temperature of from 1,550 to 1,850 °C,

wherein the inorganic fibers have an internal layer which is composed of an inorganic substance containing an amorphous substance (a) comprising Si, M, C and O, an assembly (b) of crystalline ultrafine particles of β -SiC, MC and C and amorphous substances of SiO₂ and MO₂ (M is Ti or Zr), or a mixture (c) of the above amorphous substance(a) and the above assembly (b) and a surface layer which is composed of an inorganic substance containing an amorphous substance (d) comprising Si and O and optionally comprising M, a crystalline substance (e) comprising crystalline SiO₂ and/or MO₂, or a mixture (f) of the

amorphous substance (d) and the crystalline substance (e),
and wherein the surface layer has a thickness T
(unit: μm) satisfying $T = aD$ (in which a is from 0.023 to 0.053
and D is a diameter (unit: μm) of the inorganic fiber).

5

(translation of [0002] to [0005] at line 43 in the left column
to line 17 in the right column in page 2)

[0002]

[Prior Arts and Problems thereof] JP-A-7-69747 discloses an
10 inorganic fiber sintered body which is composed of inorganic
fibers comprising Si, C, Ti or Zr, and O as constituent elements
and an inorganic substance comprising Si, Ti or Zr and O as
constituent elements and existing so as to fill interstices
between the inorganic fibers and has layers with a thickness
15 of 1 to 200 nm comprising an amorphous carbon and/or a
crystalline carbon, as boundary layers between the inorganic
fibers and the inorganic substance.

[0003] Further, the above publication discloses a process
for the production of an inorganic fiber sintered body, which
20 comprises sintering a laminate material of inorganic fibers
having an internal layer comprising Si, C, Ti or Zr, and O as
constituent elements and a surface layer comprising Si, Ti or
Zr, and O as constituent elements by stepwise
temperature-increasing in an inert gas under a pressure of from
25 50 to 1,000 kg/cm^2 .

[0004] The inorganic fiber sintered body disclosed in the
above publication has high fracture energy and excellent
dynamic properties, while it shows plastic deformation
behaviors at a high temperature of more than 1,300 °C in some
30 cases. The above inorganic fiber sintered body is hopeful as
a structural material and the structural material is required
not to show plastic deformation behaviors even at a high

temperature.

[0005] Therefore, it is desired to develop a material which retains the high fracture energy and excellent dynamic properties of the inorganic fiber sintered body disclosed in
5 the above publication and at the same time does not show plastic deformation behaviors even at an extremely high temperature of more than 1,300 °C.